Claims

1. A process for increasing the concentration of HDL cholesterol in the blood of a mammal whose blood contains cholesteryl ester transfer protein (CETP) that comprises the steps of:

(a) immunizing said mammal with an inoculum containing a CETP immunogen that is dissolved or dispersed in a vehicle, said CETP immunogen comprising an immunogenic polypeptide covalently bonded to an exogenous antigenic carrier polypeptide that is selected from the group consisting of hepatitis B core protein, tetanus toxoid, tuberculin purified protein derivative, diphtheria toxoid and branched oligolysine, said immunogenic polypeptide having a CETP amino acid residue sequence; and

(b) maintaining said immunized mammal for a time period sufficient for said immunogenic polypeptide to induce the production of antibodies that bind to CETP and lessen the transfer of cholesteryl esters from HDL.

2. The process according to claim 1 wherein said immunogenic polypeptide is recombinant human CETP.

3. The process according to claim 1 wherein said CETP immunogen comprises a fusion protein in which said exogenous antigenic carrier is peptide-bonded to the amino-terminus, carboxy-terminus or both of said immunogenic polypeptide.

4. The process according to claim 3 wherein the carboxy-terminus of said exogenous antigenic carrier is peptide-bonded to the amino-terminus of said immunogenic polypeptide.

5. The process according to claim 3 wherein said exogenous antigenic carrier is peptide-bonded to both the amino-terminus and carboxy-terminus of said immunogenic polypeptide.

6. The process according to claim 5 wherein said fusion protein is comprised of an immunogenic polypeptide having a length of about 10 to about 30 amino acid residues that is peptide-bonded to an amino-terminal flanking sequence and a carboxy-terminal flanking sequence, wherein

(a) said amino-terminal flanking sequence consists essentially of about 10 to about 20 amino acid residues having an amino acid residue sequence of the hepatitis B core protein (HBcAg) from about position 1 to about position 35, and said carboxy-terminal sequence consists essentially of about 120 to about 160 amino acid residues having an amino acid residue sequence of HBcAg from about position 10 about position 183, or

(b) said amino-terminal flanking sequence consists essentially of about 70 to about 90 residues having the amino acid residue sequence of HBcAg from about position 1 to about position 90, and said carboxy-terminal flanking sequence consists essentially of about 65 to about 85 amino acid residues having the amino acid residue sequence of HBcAg from about position 80 to about position 183.

7. The process according to claim 6 wherein the number of amino acid residues present in said immunogenic polypeptide is about equal in number to the number of amino acid residues absent from said HBcAg amino acid residue sequence between the carboxy-terminal residue position of said amino-terminal flanking

sequence and the amino-terminal residue of said carboxy-terminal flanking sequence.

8. The process according to claim 6 wherein said fusion protein is present in said vehicle as particles.

9. The process according to claim 1 wherein said immunizing step is repeated.

10. The process according to claim 9 wherein said immunizing step is repeated at intervals of about 3 to about 6 months until the HDL cholesterol value in the blood of said mammal is increased by about 10 percent or more relative to the HDL cholesterol value prior to said first immunization step.

11. A process for increasing the concentration of HDL cholesterol in the blood of a mammal whose blood contains cholesteryl ester transfer protein (CETP) that comprises the steps of:

(a) immunizing said mammal with an inoculum containing a vehicle in which is dissolved or dispersed a CETP immunogen that is a fusion protein of (i) an exogenous antigenic carrier polypeptide that is peptide-bonded to the amino-terminus, carboxy-terminus or both of (ii) an immunogenic polypeptide having a CETP amino acid residue sequence;

(b) maintaining said mammal for a time period sufficient for said immunogenic polypeptide to induce the production of antibodies that bind to CETP and ~~lessen~~ lessen the transfer of cholesteryl esters from HDL; and

(c) repeating said immunizing step until the HDL cholesterol value in the blood of said mammal is

increased by about 10 percent ~~or more~~ relative to the HDL cholesterol value prior to said first immunization step.

12. The process according to claim 11 wherein said immunogenic polypeptide is human CETP.

13. The process according to claim 12 wherein said exogenous antigenic carrier polypeptide is peptide-bonded to the amino-terminus of said human CETP.

14. The process according to claim 11 wherein said fusion protein is comprised of an immunogenic polypeptide having a length of about 10 to about 30 amino acid residues that is peptide-bonded to an amino-terminal flanking sequence and a carboxy-terminal flanking sequence, wherein

(a) said amino-terminal flanking sequence consists essentially of about 10 to about 20 amino acid residues having an amino acid residue sequence of the hepatitis B core protein (HBcAg) from about position 1 to about position 35, and said carboxy-terminal sequence consists essentially of about 120 to about 160 amino acid residues having an amino acid residue sequence of HBcAg from about position 10 to about position 183, or

(b) said amino-terminal flanking sequence consists essentially of about 70 to about 90 residues having the amino acid residue sequence of HBcAg from about position 1 to about position 90, and said carboxy-terminal flanking sequence consists essentially of about 65 to about 85 amino acid residues having the amino acid residue sequence of HBcAg from about position 80 to about position 183.

15. The process according to claim 14 wherein said immunogenic polypeptide has the sequence of the carboxy-terminal 30 amino acid residues of human CETP and includes the polypeptide of SEQ ID NO:10.

16. The process according to claim 15 wherein said fusion protein consists essentially of a polypeptide of SEQ ID NO:38 from amino acid residue position 1 through position 69, SEQ ID NO:29 and SEQ ID NO:38 from amino acid residue position 76 through position 183 peptide-bonded to each other in the order recited from amino-terminus to carboxy-terminus.

17. The process according to claim 16 wherein said fusion protein is present in said vehicle as particles.

18. A cholesteryl ester transfer protein (CETP) immunogen that comprises a fusion protein in which an immunogenic polypeptide having a CETP amino acid residue sequence is covalently bonded to an exogenous antigenic carrier.

19. The immunogen according to claim 18 wherein said exogenous antigenic carrier is peptide-bonded to the amino-terminus, carboxy-terminus or both of said immunogenic polypeptide.

20. The immunogen according to claim 19 wherein the carboxy-terminus of said exogenous antigenic carrier is peptide-bonded to the amino-terminus of said immunogenic polypeptide.

21. The process according to claim 20 wherein said exogenous antigenic carrier is peptide-bonded to

both the amino-terminus and carboxy-terminus of said immunogenic polypeptide.

22. The immunogen according to claim 21 wherein said fusion protein is comprised of an immunogenic polypeptide having a length of about 10 to about 30 amino acid residues that is peptide-bonded to an amino-terminal flanking sequence and a carboxy-terminal flanking sequence, wherein

(a) said amino-terminal flanking sequence consists essentially of about 10 to about 20 amino acid residues having an amino acid residue sequence of the hepatitis B core protein (HBcAg) from about position 1 to about position 35, and said carboxy-terminal sequence consists essentially of about 120 to about 160 amino acid residues having an amino acid residue sequence of HBcAg from about position 10 about position 183, or

(b) said amino-terminal flanking sequence consists essentially of about 70 to about 90 residues having the amino acid residue sequence of HBcAg from about position 1 to about position 90, and said carboxy-terminal flanking sequence consists essentially of about 65 to about 85 amino acid residues having the amino acid residue sequence of HBcAg from about position 80 to about position 183.

23. The immunogen according to claim 25 wherein the number of amino acid residues present in said immunogenic polypeptide is about equal in number to the number of amino acid residues absent from said HBcAg amino acid residue sequence between the carboxy-terminal residue position of said amino-terminal flanking sequence and the amino-terminal residue of said carboxy-terminal flanking sequence.

24. The immunogen according to claim 18 wherein said immunogenic polypeptide has a length of about 10 to about 30 amino acid residues.

25. An isolated and purified DNA molecule that encodes a cholesteryl ester transfer protein (CETP) immunogen that comprises (i) a DNA sequence that encodes an immunogenic polypeptide having a CETP amino acid residue sequence that is operatively linked to (ii) a DNA sequence that encodes an exogenous antigenic carrier.

26. The isolated and purified DNA molecule according to claim 25 wherein said immunogenic polypeptide is encoded by a DNA of SEQ ID NOs:1, 27 or 31.

27. The isolated and purified DNA molecule according to claim 26 wherein said exogenous antigenic carrier is encoded by a DNA of SEQ ID NO: 39 that encodes an amino acid residue sequence of SEQ ID NOs:40, 41, 42 or 43.

28. The isolated and purified DNA molecule according to claim 25 wherein the 3′ end of the DNA encoding said exogenous antigenic carrier is operatively linked to the 5′ end of the DNA encoding said immunogenic polypeptide.

29. The isolated and purified DNA molecule according to claim 25 wherein said first-named DNA (i) encodes an immunogenic polypeptide having a length of about 10 to about 30 amino acid residues.

30. The isolated and purified DNA molecule according to claim 29 wherein said second-named DNA (ii) has two portions, one of which is operatively linked to the 5′ and of said first-named DNA and another of which is operatively linked to the 3′ end of said first-named DNA, wherein

(a) said one portion encodes an amino-terminal flanking sequence that consists essentially of about 10 to about 20 amino acid residues having an amino acid residue sequence of the hepatitis B core protein (HBcAg) from amino acid residue position 1 to about position 35, and said other portion encodes a carboxy-terminal flanking sequence that consists essentially of about 120 to about 160 amino acid residues having an amino acid residue sequence of HBcAg from about amino acid residue position 10 to about position 183, or

(b) said one portion encodes an amino-terminal flanking sequence that consists essentially of about 70 to about 90 amino acid residues having the amino acid residue sequence of HBcAg from about amino acid residue position 1 to about position 90, and said other portion encodes a carboxy-terminal flanking sequence that consists essentially of about 65 to about 85 amino acid residues having an amino acid residue sequence of HBcAg from about amino acid residue position 80 to about position 183.

31. The isolated and purified DNA molecule according to claim 30 wherein said first-named DNA (i) encodes an immunogenic polypeptide of SEQ ID NOs:2-7, 8-13, 29, 32-37 or 50.

32. The isolated and purified DNA molecule according to claim 31 wherein said isolated DNA molecule consists essentially of a DNA segment that encodes amino

acid residues 1-69 of HBcAg (SEQ ID NO:38) operatively linked at its 3' end to the 5' end of DNA that encodes amino acid residues 461-476 of CETP (SEQ ID NO:29) whose 3' end is operatively linked to the 5' end of a DNA segment that encodes amino acid residues 76-183 of HBcAg (SEQ ID NO:38).

Added 1